Zigzag readout design for GEM detectors

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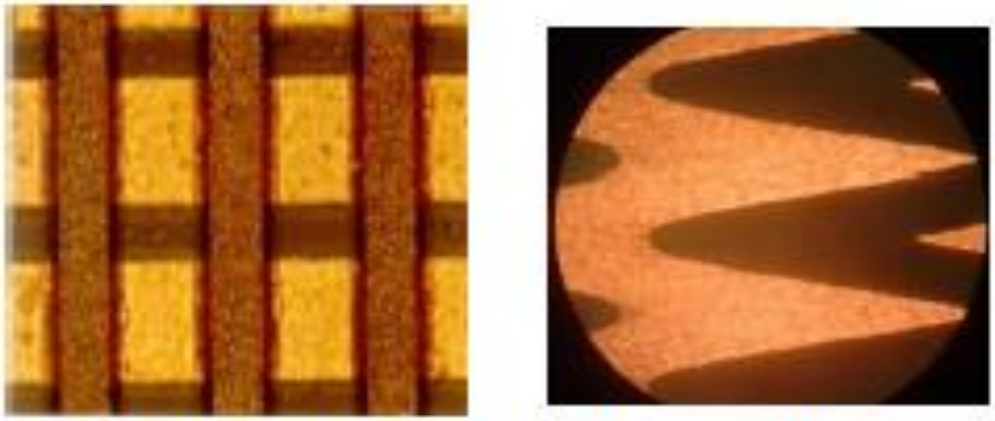
Outline

- Motivation
- Zigzag Design Method
- Design for 30 by 30 cm^2 GEM and CMS GEM
- Summary & Next plan

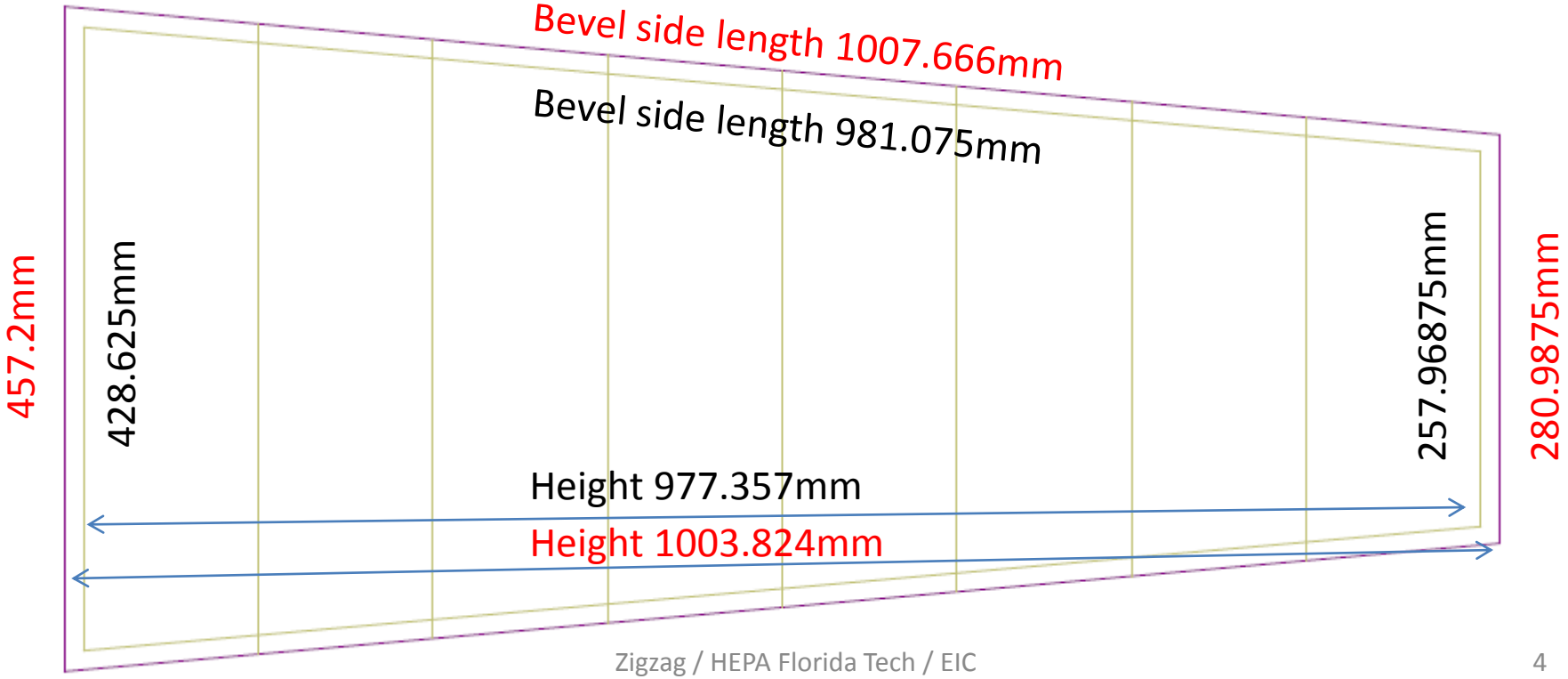
1. Motivation

- By replacing straight readout strips with zigzag strips, the number of readout channels can be reduced massively (a factor of 3).
- The zigzag strips might improve detector's spatial resolution.



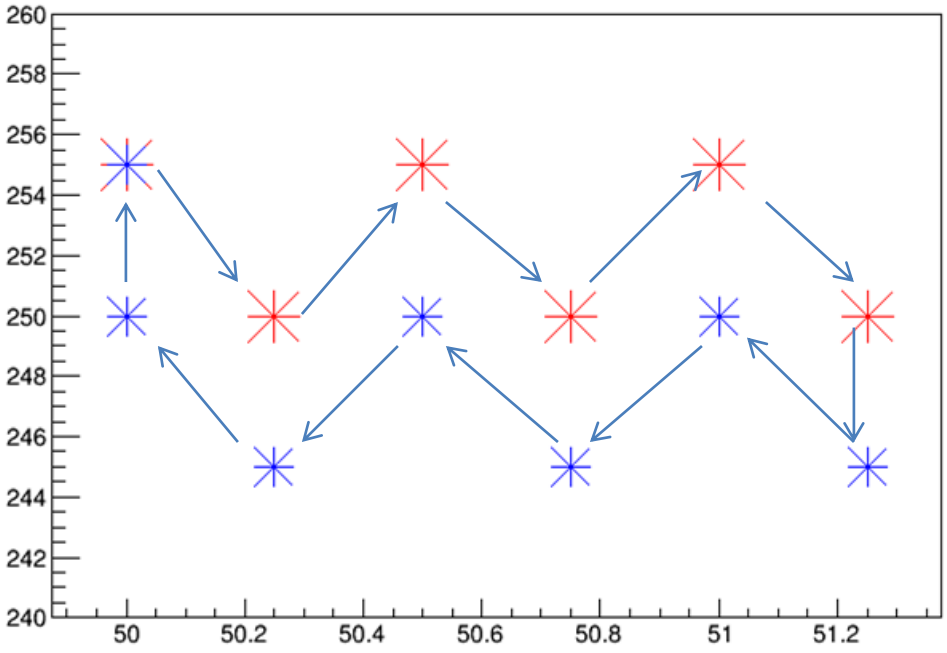
Straight strips and zigzag strips under microscope

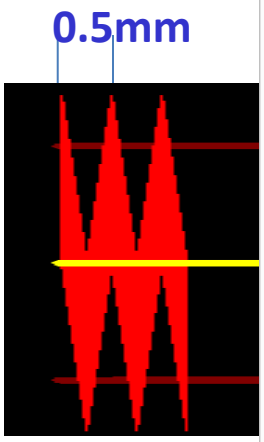
As the CMS GEM is in a trapezoid shape, we plan to design radial zigzag strips. The opening angle is about 10 degrees, if 128 strips are used, the intersection angle of two neighboring strips should be ~0.078 degree, ie., 1.745 mrad.

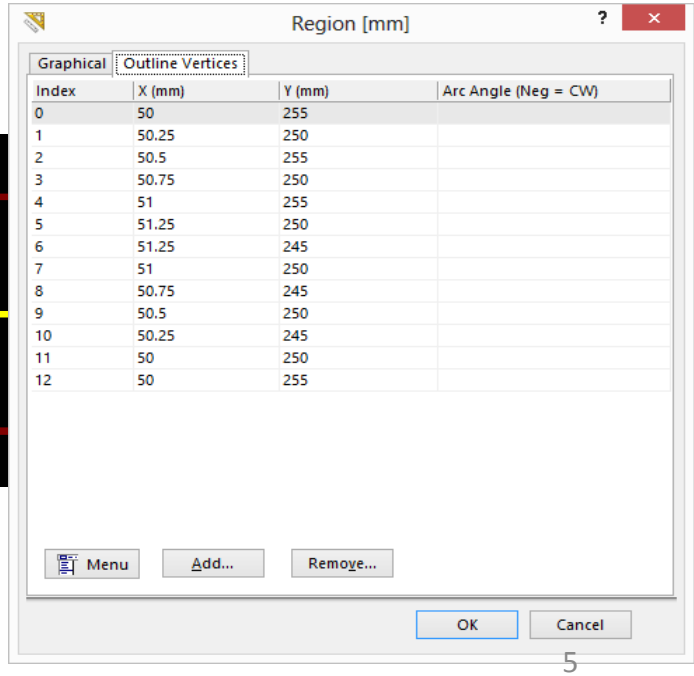


2. Design method

- Altium software is used in the design.
- A zigzag strip can be constructed from points in a specified order. Pitch of tips are 0.5mm.

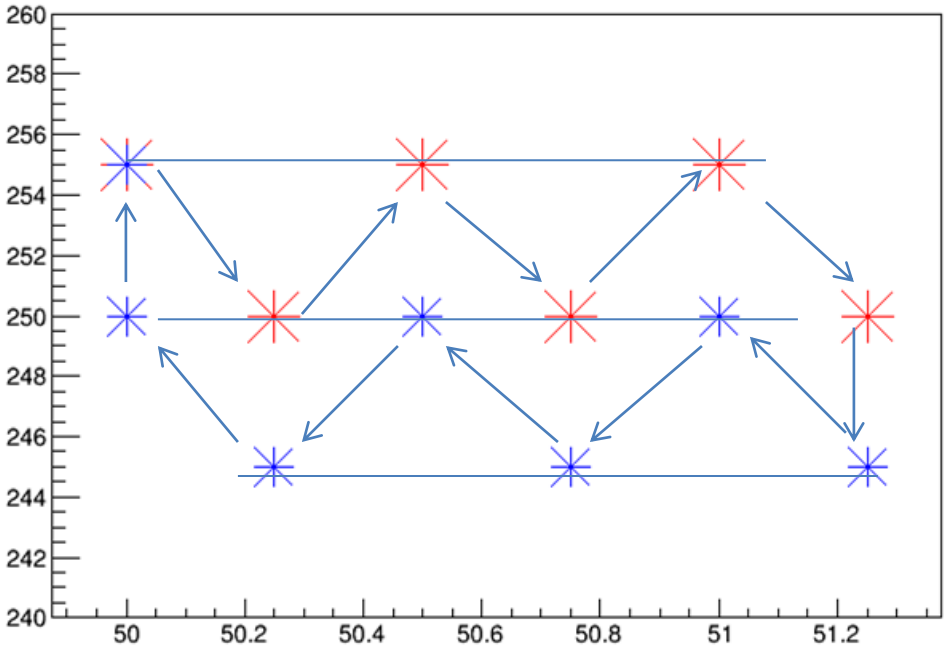


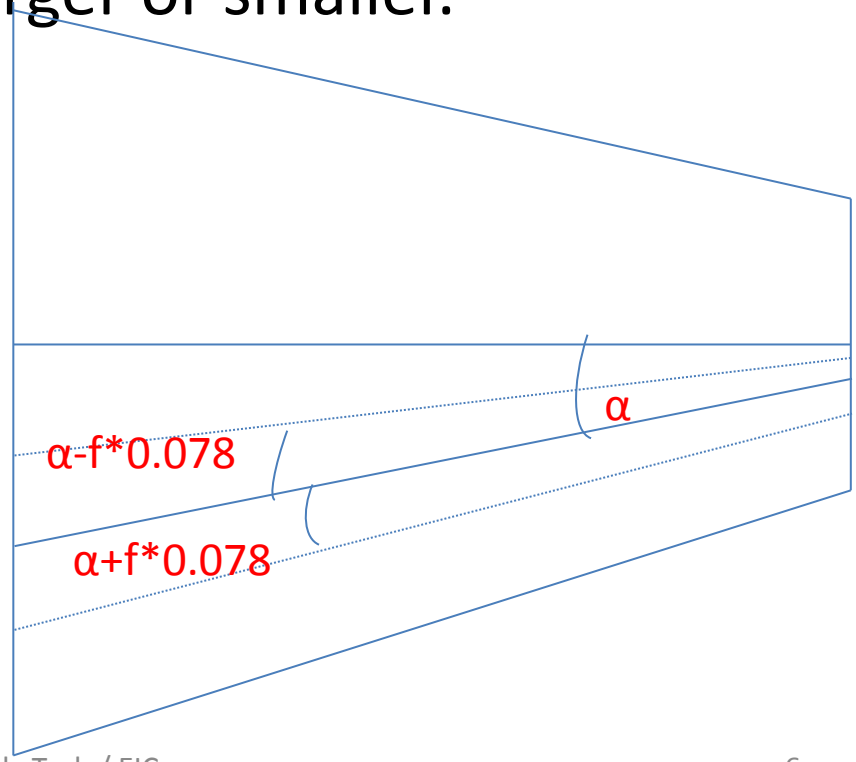




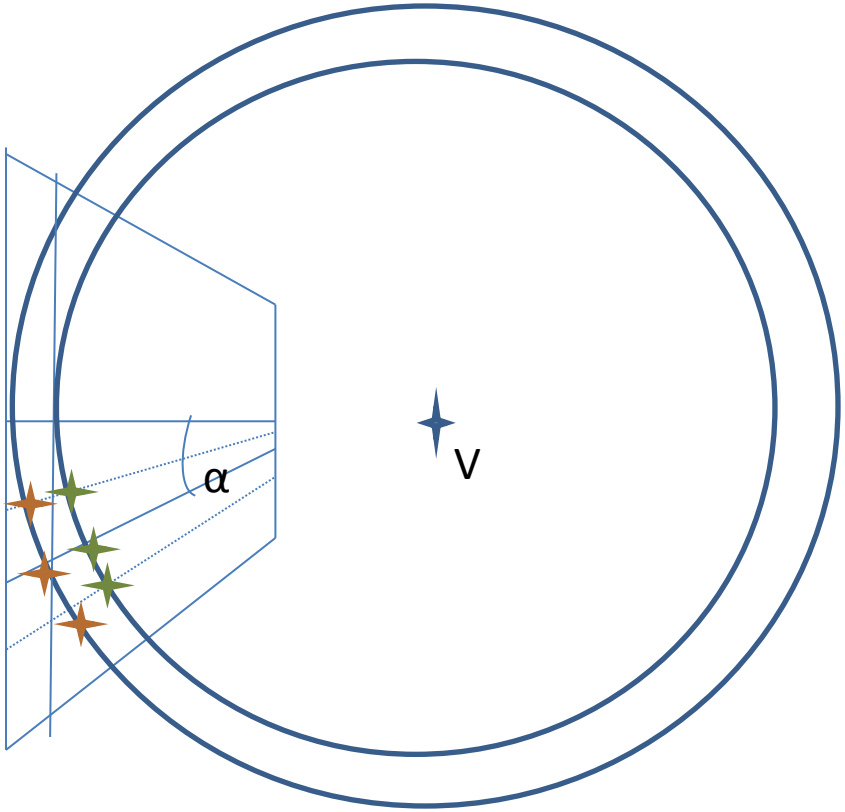
Design method (Cot.)

- The most important thing is calculating all the points. The points are standing on three lines. For one specified strip, we have a center line, and two side lines which are a factor f ~3/4 times 0.078° larger or smaller.



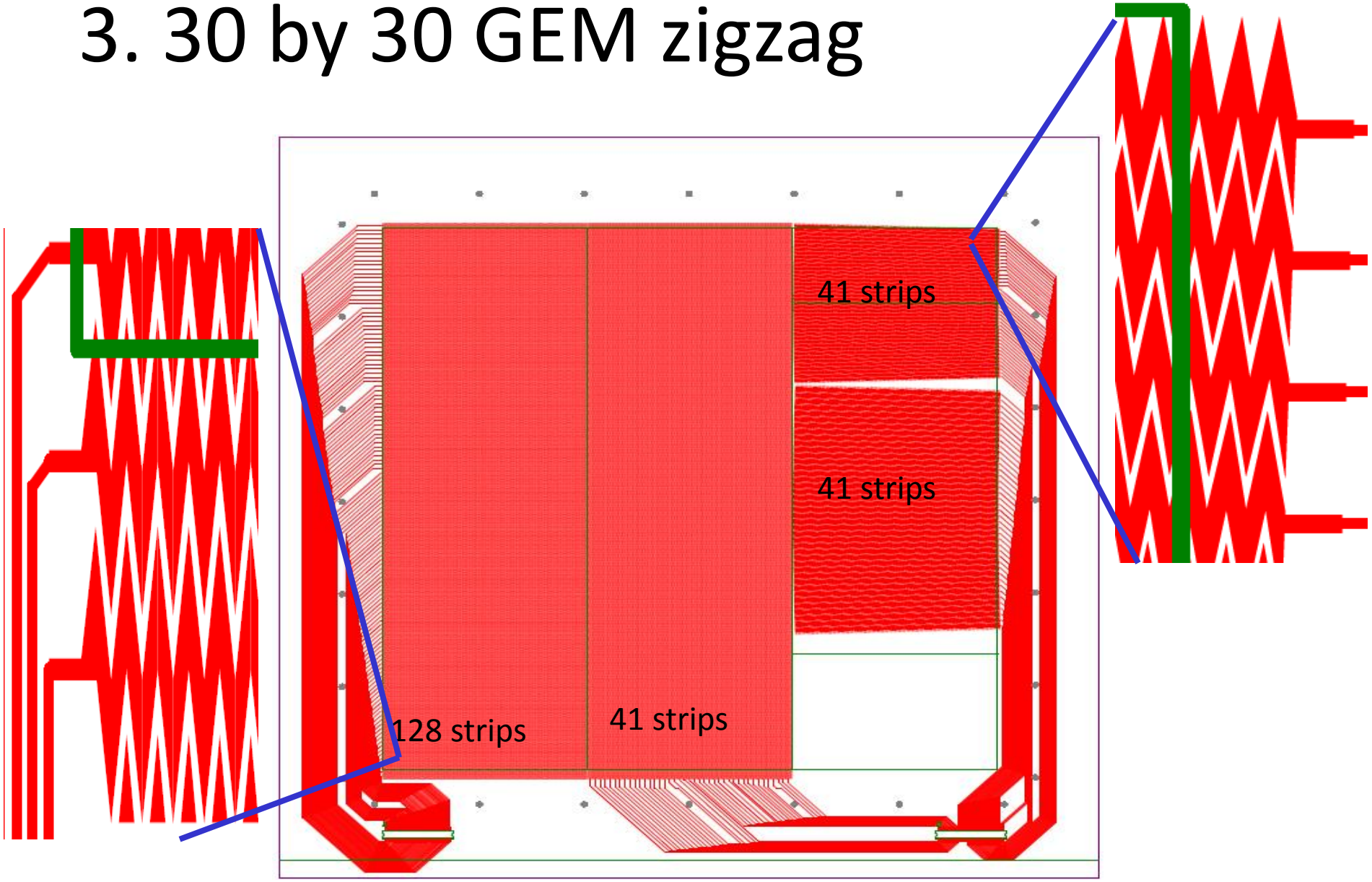


Design method (Cot.)

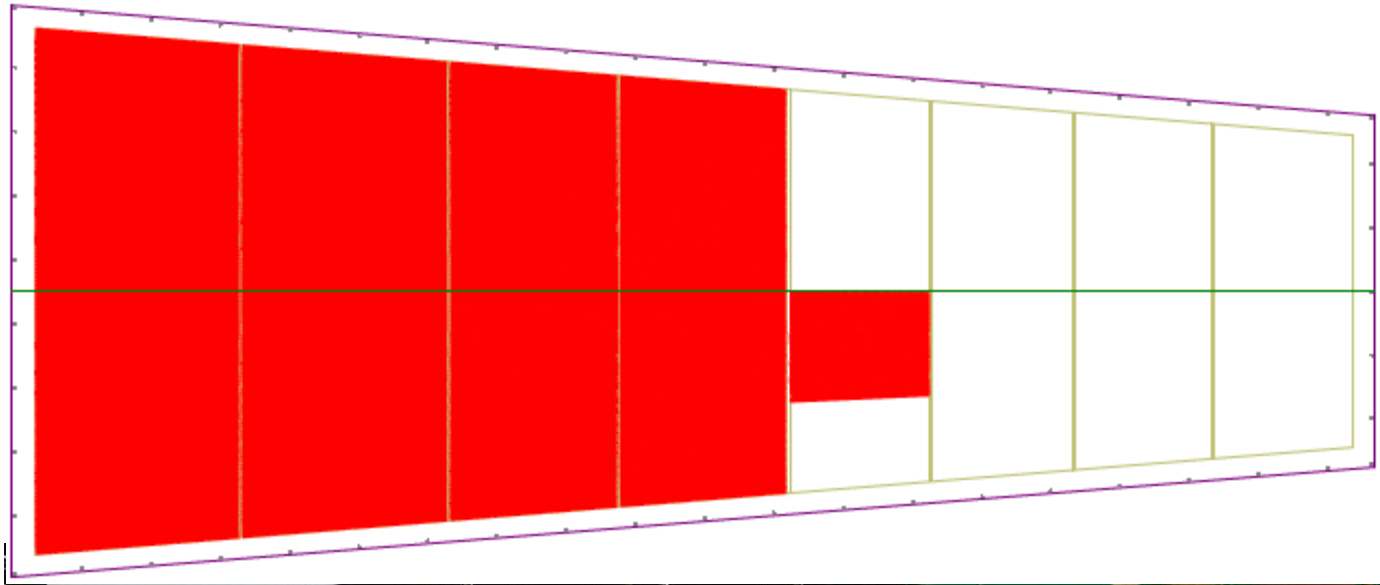


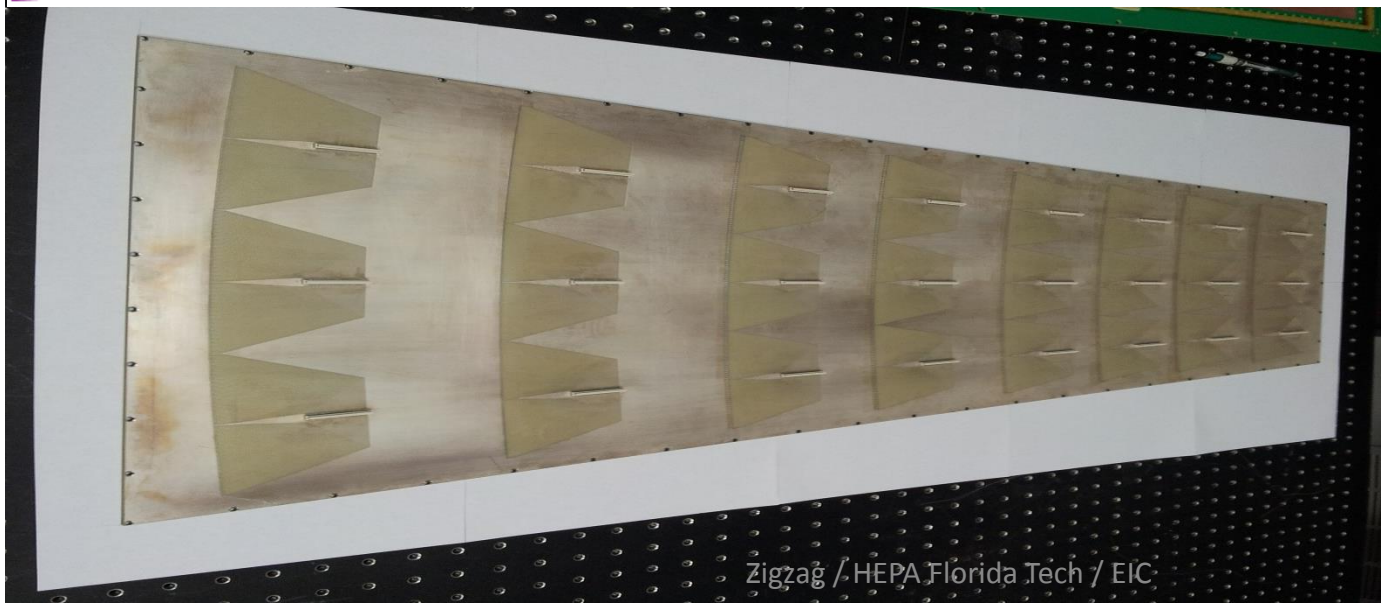
After lines are selected, the points can be figured out from concentric circles.

3. 30 by 30 GEM zigzag



4. CMS GEM zigzag

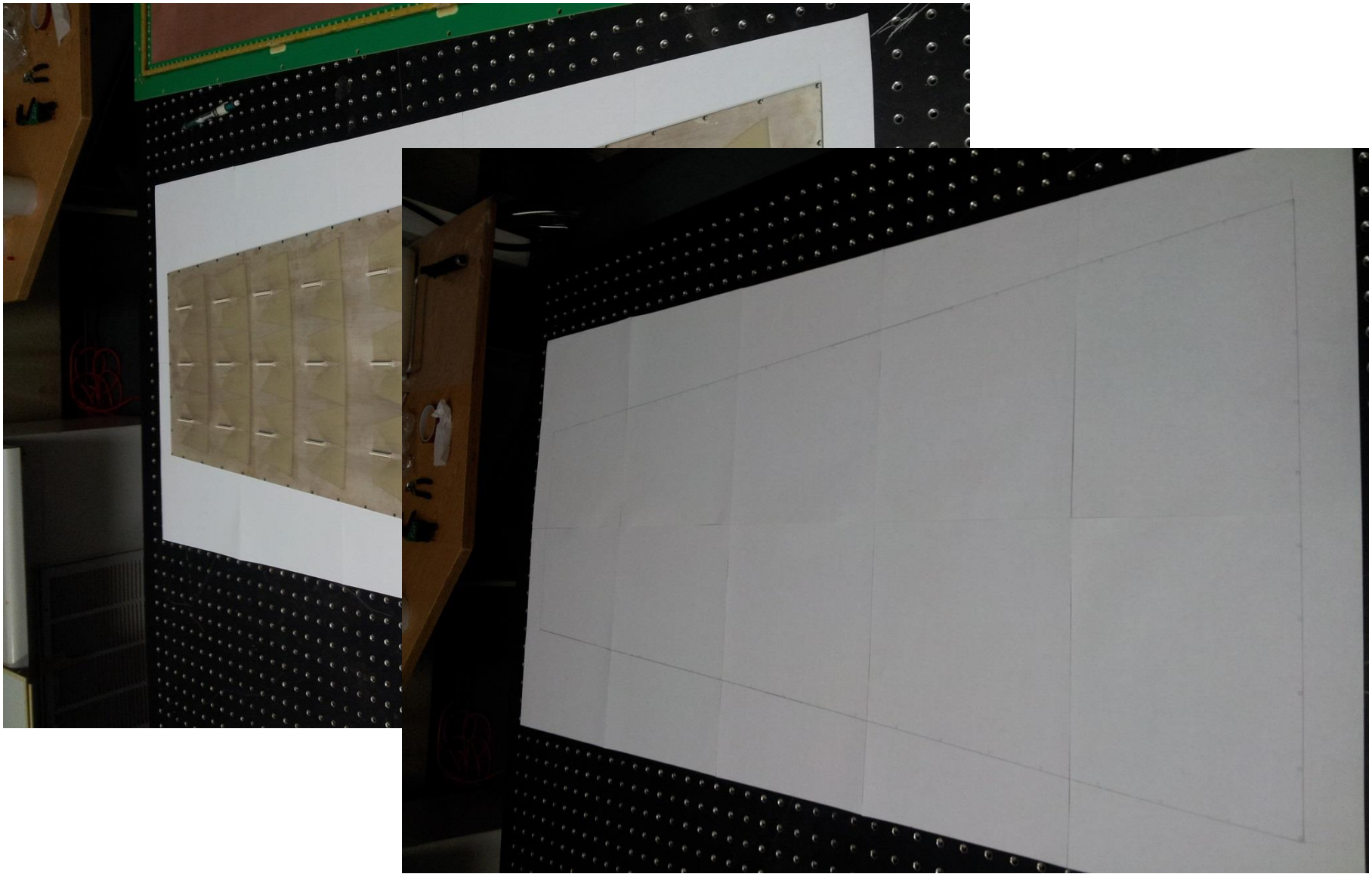
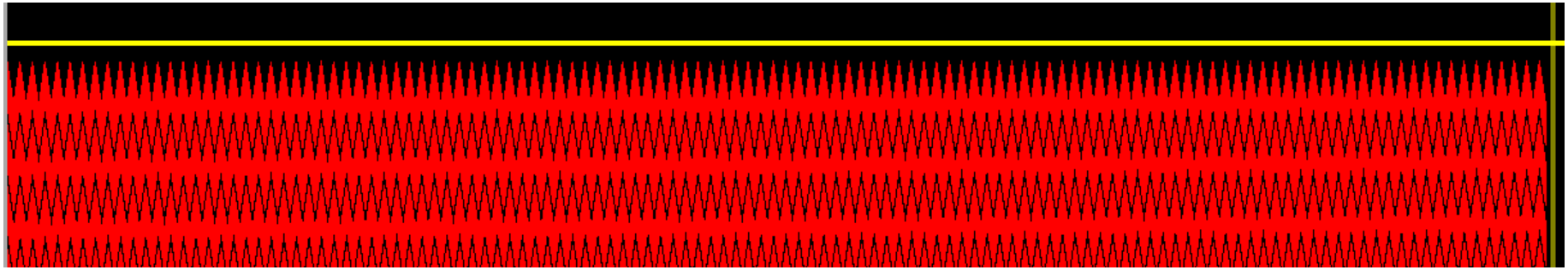




Same size as the real r/o board, with 8 sectors, each will have 129 readout channels (One Panasonic connector is able to readout one sector).

Summary & Plan

- Zigzag readout idea is attractive, it might help to reduce a lot of r/o electronics!!
- The 30 by 30 zigzag design is going to be finished, we'll ask quotes from PCB factories to get it produced. We hope to study it's performance in the upcoming beam test.
- Also the zigzag strips for CMS GEM needs to be finished.

Thanks!

Backup slide